KATHMANDU UNIVERSITY
End Semester Examination [C]
May/June, 2019

Marks scored:

Level : BE
Year : III

Course : MEEG 315
Semester : I

Exam. Roll No. :

Time: 30 mins.

F.M. : 20

Registration No.:

Date 30 MAY 2019

SECTION "A"
[20Q × 1 = 20 marks]

Choose the most appropriate answer among the given options and ***mark*** **[X]** *in the box of your choice. Use of Data Book is* ***NOT ALLOWED*** *for objective questions.*

1. Mathematic modeling is done in the following design step
   [ ] Need analysis [ ] Preliminary design
   [ ] Feasibility study [ ] Detailed design

2. Hook's law satisfy in the following range
   [ ] Elastic range [ ] Yielding range [ ] Stress hardening [ ] Necking

3. To avoid plate failure at the edge having rivet joint of size of rivet 7.5mm, the margin should be grater or equal to
   [ ] 7.5 mm [ ] 11.25 mm [ ] 3.75 mm [ ] 15 mm

4. A rivet is specified by
   [ ] Shank diameter [ ] length of rivet [ ] type of head [ ] length of tail

5. The formula to calculate diameter of the rivet for boiler joint of thickness t is
   [ ] 0.33t to 0.68t [ ] 6.07t to 6.325t
   [ ] $6.07\sqrt{t}$ to $6.325\sqrt{t}$ [ ] $0.33\sqrt{t}$ to $0.68\sqrt{t}$

6. A double fillet welded joint with parallel fillet weld of length l=20mm and leg s=10mm is subjected to a tensile force P. Assuming uniform stress distribution, the tensile strength $\sigma_t = 4\times10^8$ N/m^2, the value of P is
   [ ] 113.12 kN [ ] 56.56 kN [ ] 160.12 kN [ ] 80.36 kN

7. The parallel fillet welded joint is designed for
   [ ] tensile strength [ ] bending strength
   [ ] shear strength [ ] Compressive strength

8. The purpose/ purposes of the threaded fasteners
   [ ] to adjust [ ] to transfer power
   [ ] to hold the part together [ ] all of above

9. Which type of thread is used in bench vice?
   [ ] Square Thread [ ] Acme Thread [ ] Knuckle Thread [ ] Buttress Thread

10. Which type of thread is used for unidirectional power transmission?
    [ ] Square Thread [ ] Acme Thread [ ] Knuckle Thread [ ] Buttress Thread

11. A screw is specified by its
[ ] pitch [ ] Major diameter [ ] Minor diameter [ ] pitch diameter

12. Which of the following is true for two parallel composite spring
[ ] $K_t = K_1K_2$ [ ] $1/K_t = 1/K_1 + 1/K_2$
[ ] $K_t = K_1 / K_2$ [ ] $K_t = K_1 + K_2$

13. When helical compression spring is cut into half, stiffness of the resulting spring will be
[ ] same [ ] double [ ] one half [ ] one fourth

14. Which of the following factor/factors is/are necessary for journal bearing?
[ ] Efficiency [ ] Reliability [ ] Simplicity [ ] All of above

15. Which of the following bearing is antifriction bearing?
[ ] Journal bearing [ ] pedestal bearing [ ] collar bearing [ ] needle bearing

16. Which of the following bearing can support both axial and radial load
[ ] Needle bearings [ ] Ball bearings
[ ] Cylindrical roller bearing [ ] Thrust bearings.

17. In general the line of force in eccentrically loaded riveted joint passes through
[ ] Centre of Gravity [ ] Centre of Mass
[ ] Centroid [ ] Offset of e distance

18. Which of the following step is not included in the evaluation of Creative Problem Solving(CPS) step
[ ] Verifying the tentative solutions [ ] SWOT Analysis
[ ] Mind mapping [ ] Tests and otherwise

19. Which of the following is false for rivet joint?
[ ] Types of riveted joint are butt joint and lap joint
[ ] Pitch is the distance from the centre of one rivet to the centre of the next rivet measured parallel
[ ] Transverse pitch is the perpendicular distance between the centre lines of the successive rows of zig-zag riveted joint
[ ] Diagonal pitch is the perpendicular distance between centres of two rivet holes in adjacent rows of a zig-zag riveted joint

20. Spring index is define as
[ ] length of the spring in the free or unloaded condition
[ ] the axial distance between adjacent coils in uncompressed state
[ ] ratio of the mean diameter of the wire to the diameter of the coil
[ ] ratio of the mean diameter of the coil to the diameter of the wire

KATHMANDU UNIVERSITY
End Semester Examination [C]
May/June, 2019

30 MAY 2019

Level : BE
Year : III
Time : 2 hrs. 30 min.

Course : MEEG 315
Semester : I
F.M. : 55

SECTION "B"
[5Q. × 11 = 55 marks]

*Answer ALL questions. Use of Data Book is **ALLOWED** for this examination. Assume and/or select suitable data if not specified.*

1. (a) Mention different types of failure in the rivet joint. [2]

   (b) Design a double riveted butt joint with two cover plates for longitudinal seam of a boiler shell 1.5 m in diameter subjected steam pressure of 0.80 N/mm^2. Assume joint efficiency as 80%, allowable tensile stress in plate 100 MPa; compressive stress 140 MPa; and shear stress in rivet 60 MPa. [5]

   (c) A 50 mm diameter solid shaft is welded to a plate as shown in Figure 1. If the size of weld 20 mm, find the maximum normal and shear stress in the weld. All dimensions are in mm. [4]

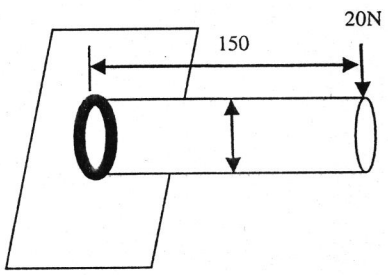

Figure 1

2. (a) How can we determine the value of stress concentration? What will be its effect if the defect is in line with the lines of forces? [3]

   (b) The bracket as shown in Figure 2, is carry a load of 80 N. determine the size of rivet if the shear stress is not exceed 50 MPa. Assume all rivets of same size. All dimensions are in mm. [5]

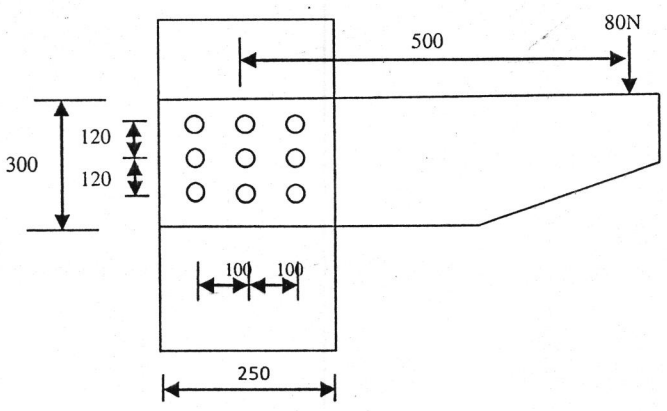

Figure 2

(c) A bracket carrying a load of 25 kN is to be weld as shown in Figure 3. Find the size of weld required if the allowable shear stress is not to exceed 85 MPa. All dimensions are in mm. [3]

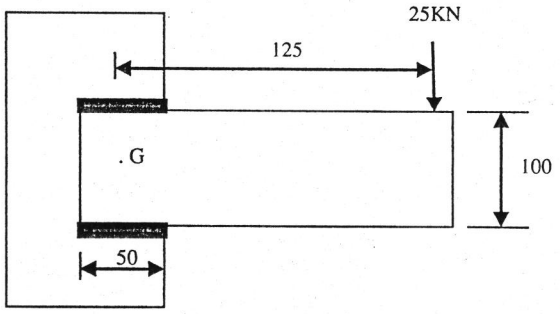

Figure 3

3. (a) Describe the application of acme thread in a power screw. [2]

(b) An electric motor driven power screw moves a nut in a horizontal plane against a force 80 kN at a speed of 300 mm/min. The screw has a single square thread of 6 mm pitch on a major diameter of 40 mm. The coefficient of friction at screw thread is 0.15. Estimate power of the motor. [4]

(c) The lead screw of a lathe has Acme threads of 50 mm outside diameter and 8 mm pitch. Screw must exert an axial pressure of 2500 N in order to drive the tool carriage. The thrust is carried on a collar 110 mm outside diameter and 55 mm inside diameter and the lead screw rotates at 30 rpm. Determine (a) the power required to drive the screw; and (b) the efficiency of the lead screw. Assume coefficient of friction of 0.15 for the screw and 0.12 for collar. [5]

4. (a) Explain Petroff's law and importance of Sommerfeld number. [3]

(b) Why lubrication is important in the journal bearing? [3]

(c) A single row deep groove ball bearing connected to a shaft rotating at 400 rpm is subjected a radial load of 1.5 kN and axial load of 0.25 kN. If desired life of bearing is 8000 hours, select the bearing. [5]

5. (a) Explain the various types of spring along with its application. [3]

(b) A composite spring has two closed coil helical spring. The outer spring is 15 mm larger than the inner spring. The outer spring has 10 coils of mean diameter 40 mm and wire diameter 5 mm. the inner spring has 8 coils of mean diameter 30 mm and wire diameter 4 mm. when the spring is subjected to an axial load of 400 N, find

i. compression of each spring,
ii. Load shared by each spring, and
iii. Shear stress induced in each spring.

The modulus of rigidity may be taken as 84 kN/mm^2. [5]

(c) A helical spring is made from a wire of 6 mm diameter and has outside diameter of 75 mm. If the permissible shear stress is 350 MPa and modulus of rigidity 100 KN/mm^2. Find the axial load which the spring can carry and the deflection per active turn. [3]